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GRADING POTATOES FOR MEALINESS AND ITS EFFECT ON RETAIL SALES*

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(Accepted for publication, December 29, 1950)

For some time it has been known that there is a high correlation between the specific gravity of potatoes and their mealiness[1]. It has also been generally presumed, and the results of consumer surveys have shown, that as far as cooking quality is concerned, the housewife prefers a mealy potato .(1) However, only in the past few years has any attempt been made, or any experiments been run to try to determine the feasibility of commercially separating potatoes by the specific gravity process. For the most part measurements of specific gravity have been used as a method of determining variety differences or variety superiority. As early as 1939, Smith and Nash,[4] in conclusion to a study on culinary quality of potatoes, suggested that "Specific gravity measurement is a practical low cost method of separating mealy from less mealy or soggy potatoes on a commercial scale".

Although a specific gravity separator has been patented in California and an experimental model has been built at the Colorado Experiment Station, in only one instance before our experiment at Cornell have tests

*Paper No.339, Department of Vegetable Crops, Cornell University.

been run of consumer acceptance of specific gravity graded potatoes. Kunkel[1] (2) in 1948-49, in a limited test on consumer reaction to specific gravity graded potatoes indicated that a majority of consumers were in favor of potatoes graded as to their cooking qualities and that a majority of the consumers stated that they would use more potatoes if they could buy them guaranteed as to their culinary quality.

The purpose of our present study was to determine to what extent consumers would purchase potatoes separated into various degrees of mealiness by the specific gravity process and approximately how much of a premium consumers would be willing to pay to have such potatoes available.

Two large stores were selected for this study in Ithaca, New York. One was a chain store and the other was a cooperative retail store. The experimental packages were in competition with the potatoes regularly being handled by the individual store.

It was originally planned that the potatoes usually handled in these two stores would be separated and used in the experiment. However, tests over a period of a month showed that the average specific gravity of the New York grown potatoes being handled by the two stores was too low for the purpose of the experiment.

Numerous tests by the Department of Vegetable Crops on most varieties commonly grown in New York State showed that Green Mountain was the only variety grown in the 1949 season which was suitable for the experiment. The average specific gravity of most varieties grown in New York State in 1949 was the lowest it had been in the past 11 years. (3) Similarly, potatoes grown in other states in 1949 were found to be of lower specific gravity than those grown in 1948 in the same areas. Normally, several of the more common varieties would have had an average specific gravity of 1.080 or higher and would have been suitable for the experiments.

A source of the Green Mountain variety was found and the same source was used throughout the experiment. The potatoes met specification of the U.S. No. 1 grade sized 1⅞ to 2¼ inches for the first 5 weeks and for the remainder of the experiment they were U.S. No. 1 grade sized 2¼ to 3¼ inches. The change in size was made because the smaller potatoes were no longer available.

Separation of Potatoes by Specific Gravity

There is quite a range in the specific gravity of the individual tubers in any lot of potatoes. There is a spread within variety, within fields and even with the tubers of a single plant. In a lot of potatoes with an average gravity of 1.080, the individual tubers may range from 1.065 to 1.095, or from the very soggy to the very mealy. In cooking trials or in tests for consumer

acceptance the potatoes should be separated on an individual basis and not on the average specific gravity of different lots.

The separation of the potatoes was done manually. Steel drums containing wire baskets were used to facilitate the separations. Potatoes were first placed in a common salt solution (NaCl) of a specific gravity of 1.080, potatoes that floated in a solution of 1.070 were the "Fryers". "Bakers", The "floaters" in the 1.080 solution were then placed in a solution of 1.070 specific gravity, and the tubers that sank were designated "Boilers". The potatoes that floated in a solution of 1.070 were the "Fryers". "Bakers", then, were potatoes with a specific gravity above 1.080; "Boilers" with a specific gravity between 1.070 and 1.080; and "Fryers" those below 1.070 in specific gravity. Check lots of unseparated potatoes were designated as "Regulars".

All the various lots of potatoes were rinsed with fresh water after separation to remove the salt, dried with fans, and packaged in 5-pound lots. The "Regulars" although never in the salt solution also were washed.

Containers Used.

The containers differed in the two experimental stores. In Store "A" a white double thickness lithographed bag was used. In Store "B" a plain brown kraft bag was used. The individual packages were stamped in color as follows:

BAKERS—Good for Baking and Mashing, U. S. No. 1, 5 lb. Net Wt., Packed by (Name of Store)

BOILERS—Good for Boiling and Mashing, U. S. No. 1, 5 lb. Net Wt., Packed by (Name of Store)

FRYERS—Good for Frying, Creaming, Scalloping, *etc.*, U. S. No. 1, 5 lb. Net Wt., Packed by (Name of Store)

REGULARS—Not Separated as to Mealiness, Similar to Our 15 lb. Bags, U. S. No. 1, 5 lb. Net Wt.
Packed by (Name of Store)

Display.

The displays of the experimental lots in each store were constant throughout the experiment, but were not identical in the two stores. The display in Store "A" was larger and the packages were more attractive than in Store "B". Each of the different classifications of the experimental potatoes, *i. e.*, "Bakers", "Boilers", "Fryers", and "Regulars", were on display at all times in two stores during the 18 week experimental period.

Signs were placed over the displays in each store to explain the differences in the contents of the experimental packages, to inform consum-

ers as to differences in mealiness, and to explain the cooking uses for which each classification was best suited.

The 5-pound package was used as it was thought that the consumer would be more apt to try the different classifications and to use the potatoes for the specific purpose if the potatoes were in small packages. The produce men in each store were instructed not to "push" any particular lot of the experimental potatoes.

There were many variations in the types of potatoes other than the experimental ones being offered to the consumers in each of the two stores. There were variations both in the size and the types of packages, in the prices per pound, in varieties, in external quality, and in cooking quality. During the experimental period about the only packaged potatoes that were of the same quality in most respects were the experimental packages.

Sales of Experimental Potatoes

During the first 10 weeks of the 18-week period, the prices of the experimental packages remained the same ,that is, there was no price differential between the different classes of the separated potatoes. During this period the prices of the 5-pound packaged potatoes were kept at approximately one-third the price of the peck packages in both stores. For the first week the price was 15 cents per 5-pound package, and the next 9 weeks the price was 17 cents per 5-pound package.

The prices were kept constant for all classifications during this period so as to give consumers a free choice of the various lots without regard to differences in price. It was thus possible to determine the various quantities and proportions of "Bakers", "Boilers", "Fryers" and "Regular" potatoes which were purchased by the patrons of these two stores without regard to price premiums for certain lots.

At the end of this 10-week experimental period, price differentials were set-up in both stores. These price differentials were based on the proportions. of the various lots which consumers purchased when there was no price differential. During this period the combined averages in the two stores was 47.7 per cent "Bakers", 28.3 per cent "Boilers", 10.4 per cent "Fryers", and 13.6 per cent "Regulars". These proportions had varied little from week to week. As most of the consumers had purchased "Bakers", the highest price was placed on the "Bakers". "Boilers" was next in sales and in price. Fewer "Fryers" were sold than the "Regulars" and they were priced the same as the "Regulars" during the first 2-week price differential period. Several price differentials were tried for a period of two weeks each. The price differentials were used to determine approximately how much per package consumers would be willing to pay for each class of separate potatoes over the non-separated package. The price of the

non-separated package ("Regulars") remained at 17 cents during the entire study.

PROPORTIONS OF BAKERS, BOILERS, FRYERS AND REGULARS PURCHASED

In Store "A" the relative choice of the purchasers of the experimental packages for the complete experiment was: 49.9 per cent "Bakers", 27.6 per cent "Boilers", 8.6 per cent "Fryers", and 13.7 per cent "Regulars". Although the price of the "Bakers" was increased over 50 per cent (from 17 cents per package to 26 cents per package) they still commanded 47 per cent of the total experimental sales. Of the four differentials tried in Store "A", none seemed to affect the relative proportions in which the consumers purchased the different experimental packages, as shown in table 1.

In store "B" the prices charged for the experimental potatoes did affect the proportions in which the consumers chose the different classes of the experimental potatoes. The average proportions in which the consumers chose the experimental potatoes in Store "B" were: 39.3 per cent "Bakers", 29.4 per cent "Boilers", 13.9 per cent "Fryers", and 17.4 per cent "Regulars". With the price increase from 17 cents to 26 cents for each 5-pound package of "Bakers" the consumer purchases of the "Bakers" fell from 41.9 per cent to 28.6 per cent of the total sales of the experimental potatoes.

At no time did the "Regulars" outsell the "Bakers" in either Store "A" or Store "B". With a price differential of 4 cents per package on the "Boilers" over the "Regulars" in Store "B", the "Regulars" did outsell the "Boilers" during one two-week period, but in another period with the same price differential the "Boilers" outsold the "Regulars". In each of the periods where price differentials were run, the combination of the sales of "Bakers" and "Boilers" was always over 60 per cent of the total experimental sales in both stores.

The weighted average of all sales of the experimental potatoes in the two stores during the 18-week experimental period was 46.4 per cent "Bakers", 28.3 per cent "Boilers", 10.4 per cent "Fryers", and 14.9 per cent "Regulars". (Table 2) There was relatively little effect of price on the *proportions* in which the consumers chose the different classes of the experimental potatoes when the sales of the two stores were combined. The range in sales of the "Bakers" was from 47.7 per cent at 17 cents per 5-pound bag to 40.6 per cent at 26 cents per 5-pound bag. Sales of "Boilers" were at a low of 24.5 per cent when the price was 21 cents per 5-pound bag but accounted for 27.1 per cent during another two weeks period with the same price. With the three price differentials tried, the range in sales of "Boilers" was from 24.5 per cent to 29.9 per cent of the total ex-

TABLE 1.—*Proportion that "Bakers", "Boilers", "Fryers", and "Regulars" were of total sales of experimental potatoes, at various prices, in each of two retail stores, Ithaca, N. Y., December 12, 1949 to April 15, 1950.*

Sales Period	Bakers			Boilers			Fryers			Regulars		
	Price per 5-lb. Bag	Store		Price per 5-lb. Bag	Store		Price per 5-lb. Bag	Store		Price per 5-lb. Bag	Store	
		"A"	"B"		"A"	"B"		"A"	"B"		"A"	"B"
	Cents	*Per cent*		*Cents*	*Per cent*		*Cents*	*Per cent*		*Cents*	*Per cent*	
10-week Period												
Dec. 12, 1949 to Feb. 18, 1950	17	50.6	41.9	17	27.4	29.7	17	8.8	13.7	17	13.2	14.7
2-week Periods (1950)												
Feb. 20—Mar. 4	24	50.9	36.5	19	30.1	29.6	17	8.6	14.6	17	10.4	19.3
Mar. 6— Mar. 18	24	49.7	41.3	21	26.6	19.6	19	7.5	13.7	17	16.2	25.4
Mar. 20— Apr. 1	26	47.0	28.6	21	25.3	30.4	19	10.6	18.9	17	17.1	22.1
Apr. 3— Apr. 15	19	47.0	41.7	19	29.2	21.9	19	7.3	12.8	17	16.4	23.5
18-week Weighted Average	—	49.9	39.3	—	27.6	29.4	—	8.6	13.9	—	13.7	17.4

TABLE 2.—*Proportion that "Bakers", "Boilers", "Fryers", and "Regulars" were of total sales of experimental lots of potatoes at various prices, average two retail stores, Ithaca, N. Y., December 12, 1949 to April 15, 1950.*

Sales Period	Bakers		Boilers		Fryers		Regulars	
	Price 5-lb. per Bag	Average 2 Stores	Price per 5-lb. Bag	Average 2 Stores	Price per 5-lb. Bag	Average 2 Stores	Price per 5-lb. Bag	Average 2 Stores
	Cents	*Per cent*	*Cents*	*Per cent*	*Cents*	*Per cent*	*Cents*	*Per cent*
10-week Period								
Dec. 12, 1949 to Feb. 18, 1950	17	47.7	17	28.3	17	10.4	17	13.6
2-week Periods (1950)								
Feb. 20—Mar. 4	24	46.0	19	29.9	17	10.7	17	13.4
Mar. 6—Mar. 18	24	47.3	21	24.5	19	9.4	17	18.8
Mar. 20—Apr.1	26	40.6	21	27.1	19	13.5	17	18.8
Apr. 3—Apr. 15	19	45.3	19	26.8	19	9.1	17	18.8
18-week Weighted Average		46.4		28.3		10.4		14.9

perimental sales. As the price was raised on the "Bakers", "Boilers", and "Fryers", the proportion of "Regulars" purchased rose from about 13.6 per cent to 18.8 per cent of the total experimental sales. So the widest range in the proportion of sales was 7 per cent of the total experimental sales; this was caused by a price increase of over 50 per cent, from 17 cents per package for the "Bakers".

Total Sales of Potatoes

During the 18 week experiment 7,565 packages of the experimental potatoes were sold. Store A accounted for 5,050 packages and Store B for 2,515 packages.

It has been shown that price differentials only slightly affected the *proportions* in which the potatoes were sold. It is of interest to find how the price differentials affected total sales. The first price differential of 24 cents for Bakers and 19 for Boilers had little effect on total sales in either store. In fact, total sales went up a little during this two-week period. The next price differential of 24 cents for Bakers and 21 cents for Boilers had practically no effect on total sales in Store A, had a slight effect on Bakers in Store B and a marked effect on the total sales of Boilers in Store B. The total sales in Store B those two weeks, averaged 120 packages per week compared to 148 with no price differential. The total weekly sales of the experimental potatoes during the two weeks of the second price differential averaged 412 packages in the two stores as compared to 443 with no price differentials.

The third price differential, which was 26 cents per 5-pound package of Bakers, over a 50 per cent increase, 21 cents for Boilers and 19 cents for Fryers as compared to 17 cents for Regulars, did have an effect on total sales of the experimental potatoes. Sales dropped approximately ⅓ in both stores although the ratio in which they were sold remained about the same as you will note in table 3 and 4.

With the fourth price differential of 19 cents per 5-pound package of Bakers, 19 cents for Boilers and 17 cents each for the Fryers and Regulars, the total sales picked up again but were not as high as they had been before the third price differential was tried.

From the above results it appears that the total sales were little affected by increases in price to 24 cents for Bakers and to 21 cents for the Boilers over the 17 cents for the unseparated potatoes. This is approximately a 40 per cent increase in price for the Bakers and a 23 per cent increase in price for the Boilers, or in other words it was 1.4 cents pound increase on the Bakers and 0.8 cent per pound increase on the Boilers with little effect on total sales or in the proportions in which the consumers chose the experimental packages.

TABLE 3.—*Average number of 5-pound packages of potatoes separated as to cooking quality, which were sold weekly at various prices in each of the two retail stores, Ithaca, N. Y., December 12, 1949 to April 15, 1950.*

Sales Period	Bakers			Boilers			Fryers			Regulars		
	Price per 5-lb. Bag	Store		Price per 5-lb. Bag	Store		Price per 5-lb. Bag	Store		Price per 5-lb. Bag	Store	
		"A"	"B"		"A"	"B"		"A"	"B"		"A"	"B"
	Cents	*Number*		*Cents*	*Number*		*Cents*	*Number*		*Cents*	*Number*	
10-week Period												
Dec. 12, 1949 to Feb. 18, 1950	17	149	62	17	81	44	17	26	20	17	39	22
2-week Periods (1950)												
Feb. 20—Mar. 4	24	156	58	19	92	48	17	26	24	17	32	31
Mar. 6— Mar. 18	24	145	50	21	78	24	19	22	16	17	47	30
Mar. 20—Apr. 1	26	96	31	21	52	33	19	22	20	17	34	24
Apr. 3—Apr. 15	19	118	50	19	74	26	19	18	16	17	42	28
18-week Weighted Average		140	55		78	39		24	20		39	25

TABLE 4.—*Average number of 5-pound experimental packages sold weekly in two retail stores and proportions that experimental lots were of total potato sales—Ithaca, N. Y. 1949-1950.*

Sales Period	Store A Experimental Package Sales		Store B Experimental Package Sales		Store A and B Combined Experimental Package Sales	
	Number Sold	(Percentage of Total) (Potato Sales)	Number Sold	(Percentage of Total) (Potato Sales)	Number Sold	(Percentage of Total) (Potato Sales)
10-week Period						
Dec. 12, 1949 to Feb. 18, 1950	294.6	28.3	148.4	14.4	443	21.4
2-week Periods						
Feb. 20—Mar. 4	305.0	22.4	160.5	12.1	465	17.3
Mar. 6—Mar. 14	291.5	20.9	120.0	10.7	412	16.1
Mar. 20— Apr. 1	203.0	17.1	108.5	9.6		13.7
Apr. 3— Apr. 15	252.0	21.6	121.0	9.5	373	15.1
Weighted Average All periods	280.5	24.5	139.7	12.5	420	18.6
Total Sales of Experimental Package in 18 Weeks	5,050		2,515		7,565	

The above figures were for total sales of experimental potatoes; however, there is another factor of importance, that is, the per cent of total potato sales in the two stores which were experimental potatoes. In Store A, where the sales of the experimental potatoes were highest, the experimental packages comprised 24.5 per cent of the poundage of potatoes sold during the 18-week experimental period. This ranged from 28.3 per cent of total potato sales at no price differential to 17.1 per cent with the highest price differential.

In Store B, the sales of experimental potatoes ranged from 14.4 per cent at no price differential to 9.5 per cent at the differential tried, and averaged 12.5 per cent for the 18-week experiment.

In each of the two stores there were other factors which probably accounted for some of the decrease in the percentage of experimental sales of total sales. For example, in Store A, the number of lots of potatoes the customer had to choose from increased from an average of 4.4 with no price differentials of experimental potatoes to 5 when the price differentials were in effect; and the number of package sizes offered increased from 2 when no price differentials were in effect to 3, when the price differentials were in effect. To make it a little clearer, during the first 10 weeks of the experiment, in Store A, the customers had a choice of a 15-pound package, bulk, or the 5-pound experimental packages; during the last 8 weeks (when the price differentials were in effect), the patrons had a choice of a 15-pound bag, a 10-pound bag, bulk or the experimental packages. The 10-pound bag was added during the price differential period on the experimental packages and this, of course, would lower the per cent any one package was of total sales. (Table 5a and 5b)

TABLE 5 (a).— *Store A. Choices consumers had of potatoes, other than experimental packages, by lots, package sizes, and range in price.*

	No. of Different Lots	No. of Different Package Sizes	Range in Price (Cents per Pound)
10-week Period	(Average)	(Average)	
Dec. 12, 1949 to Feb. 18, 1950	4.4	2	3.0 to 8.3
2-week Periods			
Feb. 20—Mar. 4	3.5	2.5	2.33 to 7.2
Mar. 6—Mar. 18	5	3.0	2.33 to 8.3
Mar. 20—Apr. 1	5	3.0	2.33 to 8.3
Apr. 3—Apr. 15	5	3.0	2.60 to 8.3

TABLE 5 (b).—*Store B. Choices consumers had of potatoes, other than experimental packages, by lots, package sizes, and range in price.*

	No. of Different Lots	No. of Different Package Sizes	Range in Price (Cents per Pound)
10-week Period	(Average)	(Average)	
Dec. 12, 1949 to Feb. 18, 1950	6.7	4.1	2.60 to 7.5
2-week Periods			
Feb. 20—Mar. 4	6.0	4.0	2.60 to 7.5
Mar. 6—Mar. 18	6.0	4.0	2.60 to 7.5
Mar. 20—Apr. 1	5.0	3.0	2.60 to 7.5
Apr. 3—Apr. 15	5.5	3.0	3.00 to 7.5

In store B, the per cent the experimental potatoes sales were of total potato sales is much smaller than in Store A. This is due to several reasons. First, the patrons of Store B had a choice, on the average, of 6.2 other lots of potatoes with an average of 3.8 different package sizes. Generally, this store had two different peck packages, two 10-pound packages, a 25-pound package and bulk potatoes as well as the experimental lots for the customers to choose from. Also, the display of the experimental potatoes was not as attractive in this store as in the other.

The decrease of experimental sales in percentage of total sales in Store B was due in part, of course, to price increases; however, part was due to increased sales of Florida potatoes when they became cheaper in the spring. During the last few weeks of the experiment when the price of Florida potatoes was lowered, the sales increased from less than 5 per cent of total volume, to average nearly 25 per cent of the total store volume, for the last five weeks of the experiment.

SURPLUS OF SEPARATED POTATOES

In the separation of the potatoes by specific gravity, a surplus of "Boilers" and "Fryers" was obtained. The actual sales of the separated potatoes was 54.7 per cent "Bakers", 33.2 per cent "Boilers", and 12.1 per cent "Fryers". Although there was some variation in the average specific gravity of the Green Mountain potatoes from the one source of supply used throughout the entire experiment, the average turnout was fairly consistent at about 40.5 per cent "Bakers", 48.5 per cent "Boilers" and

11 per cent "Fryers." In keeping a constant supply of all classifications on display in the stores, there was a surplus of "Boilers" and "Fryers", especially of the "Boilers".

The surplus was packaged in 50-pound packages and sold to institutional trade.

Quality of Potatoes Regularly Handled by Stores

For a period of 8 weeks during the experiment, samples of all potatoes being offered for sale by the two stores were tested as to specific gravity. These samples of at least 10 pounds of each particular type were selected at random from the potatoes on display in each of the two stores. The mealiness, or specific gravity, of the potatoes varied widely within each individual package and varied from week to week within the same type package. One week the average specific gravity of a particular package would be high, although individual tubers in the package varied considerably. The next week the average specific gravity of the same type package would be quite low.

Analysis of these samples table 6, shows little correlation between the prices charged for the potatoes and the specific gravity or mealiness of the tubers in the packages. None of the non-experimental lots of potatoes in either store was of as high a degree of mealiness as were the experimental "Bakers". In only one instance out of eight were the Idaho potatoes of the Russet Burbank variety all above 1.080 in specific gravity. In other lots of the Idaho potatoes as few as 64 per cent of the individual tubers in a package met the requirements of the experimental "Bakers", above 1.080 in specific gravity.

Consumer Reaction to Potatoes Separated As to Mealiness

As a method of getting information from the consumers who purchased the experimental potatoes, a questionnaire was included in each five-pound package for two weeks, during the tenth and eleventh week of the experiment. The primary purpose of the questionnaire was to try to determine whether the consumer purchasing the potatoes used them for the purposes for which they were intended and whether or not the potatoes were satisfactory for that purpose.

During the two-weeks' period 1074 questionnaires were used and 146 were returned. This was a 13.6 per cent return. The cards were returned in each experimental class roughly in proportion to the weekly sales of each class during this two-weeks' period.

TABLE 6.—*Mealiness and price per pound of potatoes regularly handled by each of the two retail stores, by type of package, Ithaca, N. Y., 8-week period, Jan. 9, 1950 to Mar. 6, 1950.*

Store and Type of Package	Sample No.	Size of Tubers	Price per Pound	Proportion of Regularly Handled Potatoes That Would Classify as:		
				Bakers	Boilers	Fryers
Store "A"			*Cents*		*Per Cent*	
15-lb. bag	1	2¼" and up	3.13	26.1	41.5	32.4
	2	2¼" and up	3.13	9.1	28.9	62.0
	3	2¼" and up	3.26	2.8	23.7	73.5
Bulk	1	2" and up	6.80	10.0	49.6	40.4
15-lb. bag	1	1⅞"—2¼"	2.60	36.7	48.7	14.6
	2	2¼" and up	3.00	23.1	47.7	29.2
10-lb. bag	1	2¼"—3¼"	3.90	32.5	48.3	19.2
	2	2¼"—3¼"	4.90	11.0	44.5	44.5
	3	2" and up	7.64	88.5	8.7	2.8
Bulk	1	2" and up	8.42	14.4	37.0	48.6

Consumer Use of Potatoes Separated by Specific Gravity

It was found that 43.2 per cent of the 81 consumers who purchased "Bakers" used the potatoes for baking only, 6.2 per cent used the "Bakers" for baking or mashing and 1.2 per cent used the "Bakers" for mashing only. As baking and mashing were the purposes indicated on the packages for which the potatoes were intended, 50.8 per cent of the consumers used the "Bakers" only for the purpose for which they were intended. Forty-three and two-tenths per cent of the consumers purchasing "Bakers" used the potatoes for baking and for a combination of other uses. These consumers indicated that they used each package of "Bakers" for two or more cooking uses, but that a part of each package of "Bakers" was used for baking. Only 6.2 per cent of the consumers used all the potatoes in the packages of "Bakers" for purposes not stated on the packages. (Table 7)

Table 7.—*BAKERS: Use reported by 81 consumers of 5-pound packages of "Bakers", two retail stores, Ithaca, N. Y. Feb. 1950*

Use Indicated by Consumers	Number of Consumers Reporting	Per cent of Total
Baking* only	35	43.2
Baking* and mashing*	5	6.2
Mashing* only	1	1.2
Baking* and one or more other uses, including boiling, frying, scalloping, mashing, etc.	35	43.2
All other uses	5	6.2
Total	81	100.0

*Use indicated on the package of "Bakers", for which the potatoes were best suited.

In other words, of the consumers purchasing "Bakers", 93.8 per cent used at least a part of each 5-pound package for baking or mashing and 50.8 per cent of the consumers used the potatoes for baking or mashing only.

Of the 43 consumers who reported that they purchased "Boilers", 90.7 per cent indicated that they used at least a part of each 5-pound package for boiling and 51.2 per cent of the consumers of "Boilers" used the contents only for boiling or mashing, these being the purposes indicated on the containers for which the potatoes were best suited. (Table 8)

TABLE 8.—*BOILERS: Use reported by 43 consumers of 5-pound packages of "Boilers", two retail stores, Ithaca, N. Y., Feb. 1950.*

Use Indicated by Consumers	Number of Consumers Reporting	Per cent of Total
Boiling* only	20	46.5
Boiling* and mashing*	2	4.7
Boiling* and one or more other uses, including baking, frying, creaming, scalloping, roasting, etc.	17	39.5
All other uses	4	9.3
Total	43	100.0

*Use indicated on the packages of "Boilers" for which the potatoes were best suited.

The use of the "Fryers", as reported by consumers was similar to the use made of the "Bakers" and "Boilers". One-half of the 12 consumers who reported that they purchased "Fryers" stated that they used the contents only for frying, creaming, or scalloping, these being the purposes indicated on the packages. At least a part of each package of "Fryers" was used for frying by 5 of the 6 other consumers, and only 1 of the 12 consumers who purchased "Fryers" did not use any of the potatoes for frying, creaming or scalloping. (Table 9)

TABLE 9.—*FRYERS: Use reported by 12 consumers of 5-pound packages of "Fryers", two retail stores, Ithaca, N. Y., Feb. 1950.*

Use Indicated by Consumer	Number of Consumers Reporting	Per cent of Total
Frying,* creaming* or scalloping*	6	50.0
Frying,* boiling and baking	3	25.0
Frying* and boiling	2	16.7
Boiling	1	8.3
Total	12	100.0

*Use indicated on the packages of "Fryers" for which they were best suited.

DEGREE OF CONSUMER SATISFACTION WITH SEPARATED POTATOES

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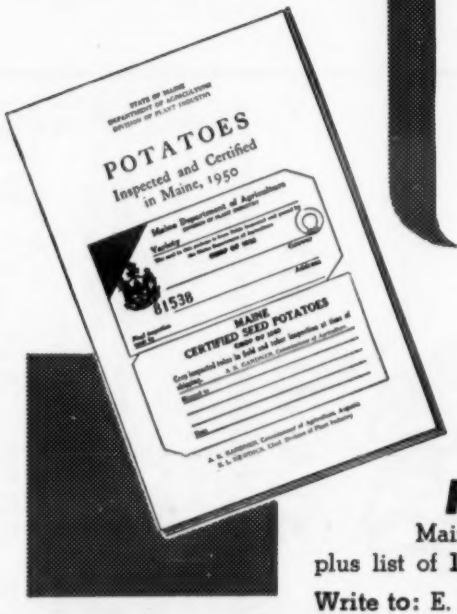

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Ninety-three and nine-tenths per cent of the consumers stated that the separated potatoes were satisfactory for the purpose for which they were used, 4.6 per cent stated that the potatoes were unsatisfactory, and 1.5 per cent stated that although the potatoes were satisfactory, there were some defects in them. Practically none of the consumers who stated that the potatoes were unsatisfactory based her dissatisfaction on the mealiness of the tubers. In most cases it was size or external defects. In only two instances did consumers express dissatisfaction because of the mealiness or texture of the potatoes. One consumer reported that the "Bakers" were "Fair only—very coarse grained" and another consumer reported the "Boilers" as "Too dry." (Table 10)

TABLE 10.—*Degree of satisfaction with the experimental lots of potatoes, separated by specific gravity, as reported by 142 consumers, Ithaca, N. Y., February 13-25, 1950.*

Classification of Potatoes Purchased	Proportion of Consumers Reporting Potatoes			Total Replies*
	Satisfactory	Not Entirely Satisfactory	Unsatisfactory	
		Per cent		
Bakers	92.4	2.5	5.1	79
Boilers	95.2	—	4.8	42
Fryers	100.0	—	—	11
Average	93.9	1.5	4.6	142

*Four consumers did not reply to this question.

CONSUMERS WILLINGNESS TO PAY MORE TO HAVE MEALINESS-SEPARATED POTATOES AVAILABLE.

The first week the questionnaires were placed in the packages the prices of all classes of the experimental potatoes were at 17 cents per five-pound package and had been at that price for 9 weeks. The second week the questionnaires were in the packages the prices were 24 cents for "Bakers"; 19 cents for "Boilers"; and 17 cents for "Fryers" and "Regulars." The questionnaires were not coded as to time so that it is difficult to evaluate the consumers' returns to the question "How much more would you be willing to pay to have *such* potatoes available?" The consumer may have interpreted the question as "How much more would you pay over non-separated potatoes?"; or "How much more would you pay than you are paying at the present time?" For instance there is no way of determining whether the consumer based her answer on 24 cents or 17 cents for a

5-pound package of "Bakers". The returns show, however, that most consumers who reported would be willing to pay something for the service.

Of the consumers reporting that they had purchased "Bakers", almost one-third stated that they would be willing to pay 5 cents more per 5-pound bag to have them available, slightly more than one-quarter would pay 3 cents more, and almost one-fifth would pay nothing more. The consumers reported that they would be willing to pay an additional 3.08 cents, weighted average amount, per 5-pound package or about 3/5 of a cent per pound for the "Bakers" (Table 11).

TABLE 11.—*BAKERS: Price premiums per 5-pound package that 78 consumers reported they would be willing to pay to have such potatoes available, two retail stores, Ithaca, N. Y., February 13-25, 1950.*

Price Premium Per 5-lb. Bag	Number of Consumers Reporting	Per cent of Total
Cents		
0	15	19
1	6	8
2	5	6
3	20	26
4	5	6
5	25	32
10	2	3
Total	78	100

The consumers who reported that they had purchased "Boilers" were willing to pay, on the average, 2.39 cents per package more to have them available. Forty-six and three-tenths per cent of the consumers stated that they would be willing to pay from three to five cents more per five-pound package. (Table 12)

In analyzing consumers reaction to the question on price of "Fryers" it must be kept in mind that not very significant conclusions can be drawn from the 11 replies received. Three said they would pay nothing more; three that they would be willing to pay 2 cents more per 5-pound package to have "Fryers" available. The weighted average of the willingness of consumers to pay higher prices for "Fryers" was 2.36 cents more per 5-pound package. (Table 13)

In the consumers reactions to the question on price, it should be remembered that although the consumers stated that they would be willing

to pay on the average, 3.08 cents more per 5-pound package of the "Bakers", some of them did pay up to 7 cents more without markedly affecting the proportions in which the experimental packages were sold or the total volume of the "Bakers." A similar reaction occurred toward purchase of the "Boilers", in that price differentials of 4 cents over the "Regulars" did not alter the sales to any great extent.

TABLE 12.—*BOILERS: Price premiums per 5-pound package that 41 consumers reported they would be willing to pay to have such potatoes available, two retail stores, Ithaca, N. Y., February 13-25, 1950.*

Price Premium Per 5-lb. Bag	Number of Consumers Reporting	Per cent of Total
Cents		
0.0	10	24.3
1.0	3	7.3
2.0	9	22.0
3.0	8	19.5
4.0	2	4.9
5.0	9	22.0
Total	41	100.0

TABLE 13.—*FRYERS: Price premiums per 5-pound package that 11 consumers reported they would be willing to pay to have such potatoes available, two retail stores, Ithaca, N. Y., February 13-25, 1950.*

Price Premium per 5-lb. Bag	Number of Consumers Reporting	Per cent of Total
Cents		
0.0	3	27.3
1.0	0	00.0
2.0	3	27.3
3.0	2	18.2
4.0	1	9.0
5.0	2	18.2
Total	11	100.0

Package Size Preferences of Consumers

The 5-pound packages were used in the experiment because it was thought that the consumers would be more likely to try the different classes of potatoes and to use them for specific purposes if they were in small packages. In the question "What size package would you prefer", the consumers' favorite single package size was the 5-pound bag. However, a large proportion indicated that they would prefer 10 or 15-pound packages. (Table 14)

Table 14.—*Size of package preferred for potatoes separated as to specific gravity, as reported by 146 consumers, Ithaca, N. Y., February 13-25, 1950.*

Size of Package	Number of Consumers Reporting*	Per cent of Total
Less than 5 pounds	3	2
5-pound	59	36
7½-pound	23	14
10-pound	38	24
15-pound	35	22
50-pounds or larger	4	2
Total	162	100

*The total replies exceed 146 because some consumers indicated that they preferred more than one size package.

Income of Consumers Reporting

The family income per week of the consumers purchasing the potatoes separated by specific gravity in the two stores was relatively high. The range in income was from "less than $30" to "$100 or more" per week. Only 4 of the consumers reporting had incomes of less than $30 per week and only 18 of the 142 were below $50 per week. On the other hand 99 of the 142 had incomes of $60 or more per week. The majority of the consumers reported that the family weekly income was more than $75 per week.

In tabulating the price the consumers would be willing to pay to have the separated potatoes available in relation to weekly family income, those members of the lower income groups, who bought and reported on their purchases, said they were willing to pay just as much more for the separated potatoes as were those of higher income groups.

Summary and Conclusions

The purpose of this study was to determine to what extent consumers would purchase potatoes separated into various degrees of mealiness by the specific gravity process, and approximately how much of a premium consumers would be willing to pay to have such potatoes available. Data were collected for an 18-week period in two large retail stores in Ithaca, N. Y., where the consumers were offered the choice of four lots of experimental potatoes in addition to the usual store offerings. Three of the four lots were separated according to their degree of mealiness and the fourth was a check lot of non-separated potatoes. All experimental potatoes were offered at the same price for a 10-week period; then price differentials within the experimental lots were used. A questionnaire was included in the experimental potato packages for a two-weeks period to obtain information from the consumers concerning use, degree of satisfaction, price they were willing to pay, package size preferred for the experimental potatoes, and family income of the purchasers.

1. Consumers preferred potatoes separated as to specific gravity over non-separated potatoes within the experimental lots.

2. Of the 7,565 five pound packages of experimental potatoes sold, 46.4 per cent were "Bakers", 28.3 per cent "Boilers", 10.4 per cent were "Fryers", and 18.6 per cent were "Regulars."

3. The majority of the consumers used the specific gravity separated potatoes for the purposes for which the potatoes were intended. Of the "Bakers" 50.8 per cent of the consumers used the potatoes only for baking or mashing, 93.8 per cent used at least a part of each package for baking. Of the "Boilers" 51.2 per cent of the consumers used the potatoes only for boiling or mashing and 90.7 per cent used at least a part of each 5-pound package for boiling. About the same degree of specificity was used by the consumers of the "Fryers" as on the "Bakers" and "Boilers" in that 50 per cent of the consumers used the "Fryers" only for the purpose stated on the containers and that 91.3 per cent of the consumers stated that they used at least a part of each package for frying.

4. Of the consumers returning questionnaires,. 93.9 per cent stated that the separated potatoes were satisfactory for the cooking purpose for which they were used. One and five-tenths per cent stated that the separated potatoes were satisfactory but that they contained some minor defects, and 4.6 per cent indicated that the separated potatoes were unsatisfactory. Of the consumers who stated that the potatoes were unsatisfactory, only two based their dissatisfaction on the mealiness of the tubers. One consumer stated that the "Bakers" were "Too coarse grained", and one stated that the "Boilers" were "Too dry."

5. Although the price differentials on the separated potatoes resulted in a decrease in volume of sales of the experimental lots as compared to total store sales, it did not materially alter the choice the consumers made of the different classes within the experimental lots.

6. Most consumers stated that they would pay more to have available potatoes separated as to specific gravity. The weighted average of all consumer questionnaire returns indicated that the consumers were willing to pay 3.08 cents more per 5-pound bag of "Bakers", 2.39 cents more for "Boilers" and 2.36 cents more for "Fryers."

7. Although the consumers stated that they would be willing to pay 3.08 cents more per 5-pound bag of "Bakers" over the unseparated potatoes, they did pay up to 7 cents more without an appreciable decrease in total sales of the "Bakers" and although the consumers stated they would be willing to pay 2.39 cents more per 5-pound package of the "Boilers" over the unseparated potatoes, they did pay 4 cents more without materially affecting total sales.

8. The average weekly income of the consumers as reported in the questionnaire was fairly high; over 50 per cent of the consumers reported weekly family incomes of more than $75.00. The consumers from the lower income groups stated, however, that they would be willing to pay as much to have the separated potatoes available as the higher income groups.

9. More consumers (36.4 per cent) preferred a 5-pound package for potatoes separated as to specific gravity than any other size, however, 23.5 per cent preferred a 10-pound package, 21.6 per cent 15-pound package and 12.4 per cent favored a 7½ pound package.

10. The potatoes separated as to specific gravity comprised a substantial proportion of the total sales of potatoes in the two stores although it varied with the quality of the other potatoes offered for sale to the consumers, with the total number of choices of potatoes as to package size and price, and with the prices asked for the experimental lots.

11. It appears from the results of this experiment that the specific gravity method of grading potatoes as to mealiness or cooking quality would be practical on a commercial basis and that consumers would prefer and would pay more for potatoes separated as to specific gravity over non-separated potatoes of the same type.

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INFLUENCE OF LOCATION ON THE ASCORBIC ACID CONTENT OF THE IRISH POTATO

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The potato is one of the leading constituents of the American diet, and this fact alone makes it particularly imperative to evaluate its food value carefully. Within the past few years the consumer has been educated to purchase foods that are a rich source of vitamins, and consequently there is an increasing public shift toward those foods reported to have a high vitamin content. In spite of this "vitamin complex" consumers continue to buy potatoes because they are considered as essential to the meal as bread and butter.

Investigations of ascorbic acid content of potatoes have been conducted by many workers, but there is no universal agreement as to which factors affect the amount of ascorbic acid in the tubers. In this investigation, originally planned to determine changes of ascorbic acid content in Louisiana-grown potatoes in storage, it was particularly noted that location materially affected the ascorbic acid content of five varieties of potatoes. Analytical tests confirmed earlier work that there was a steady decrease in the ascorbic acid content of the tubers during storage and this phase of the study is not being reported for that reason. The influence of location on ascorbic acid content, however, helps to clarify the problem of factors affecting ascorbic acid content in potatoes and is of prime importance for that reason.

PROCEDURE

Five varieties of potatoes, LaSoda, DeSoto, Katahdin, LaSalle and Triumph, were obtained from the same seed source and planted in five locations in Louisiana. Data were collected for two years at Plaquemines Parish Experiment Station at Diamond, the Fruit and Truck Crop Experiment Station at Hammond, the Bergeron Farm at Thibodaux, Ben Hur Farm at Baton Rouge, and the North Louisiana Experiment Station at Calhoun. These locations were separated enough so as to give a fairly good representation of soil type and various climatic conditions.

The tubers were harvested 90 days from planting time and the ascorbic acid and dry weight were determined. Each variety was analyzed in duplicate. The ascorbic acid content was determined by the method outlined by Morell (3) in his report of "Rapid Photometric Determinations of Ascorbic Acid in Plant Materials."

The data obtained from the five testing areas were analyzed by analysis of variance (5).

It was emphasized by the *Climatological Data of Louisiana* (6) that the rainfall of 1950 was more evenly distributed over the growing period and, the temperatures were generally cooler than in 1949 when the rainfall and temperatures were more irregular.

Unpeeled radial sections were sliced off of five random tubers for each sample for analysis by trained technicians in the biochemical laboratory. Duplicate samples consisted of slices from five other tubers.

Results of Investigation

AVERAGE ASCORBIC ACID AND DRY WEIGHT CONTENTS OF POTATOES FOR THE TWO YEARS AND FIVE LOCATIONS

(Ascorbic acid expressed in mg/100 grams fresh weight)
(Dry weight expressed in percentage)

Variety	Plaquemines	Thibodaux	Hammond	Ben Hur	Calhoun
LASODA					
Ascorbic Acid	17.12	14.71	18.83	19.44	26.51
Dry Weight	16.69	17.64	15.80	15.53	17.09
DESOTO					
Ascorbic Acid	15.89	12.29	19.24	19.66	22.77
Dry Weight	18.05	17.56	18.97	18.15	18.11
KATAHDIN					
Ascorbic Acid	19.15	11.21	14.77	16.51	27.23
Dry Weight	17.57	17.97	17.15	17.40	16.21
LaSALLE					
Ascorbic Acid	15.87	11.74	21.59	19.21	25.36
Dry Weight	18.62	16.71	16.89	17.42	17.61
TRIUMPH					
Ascorbic Acid	19.12	15.12	21.31	17.01	26.27
Dry Weight	17.10	17.97	16.81	16.72	16.39
AVERAGE					
Ascorbic Acid	17.43	13.01	19.15	18.37	25.63
Dry Weight	17.60	17.56	17.12	17.04	17.11

Ascorbic Acid

L.S.D. at the .05 level 3.32 for locations
L.S.D. at the .01 level 4.47

L.S.D. at the .05 level 2.33 for varieties
L.S.D. at the .01 level 3.13

Dry Weight

L.S.D. at the .05 level 1.06 for locations
L.S.D. at the .01 level 1.42

L.S.D. at the .01 level .75 for varieties
L.S.D. at the .01 level 1.42

From the analysis of variance for ascorbic acid, it was observed that there are not significant differences among varieties in their ascorbic acid content although Triumph is approaching significance. There are highly significant differences among locations, with the potatoes grown at Calhoun being significantly higher in ascorbic acid content than those grown at all other locations. The tubers grown at Thibodaux had the lowest average content for both years. The ascorbic acid content of the tubers did not vary significantly from year to year at Plaquemines, Thibodaux, Hammond and Ben Hur.

From the analysis of variance for dry weights it was observed that there are highly significant differences in varieties regarding their dry weight content, but of still greater importance are the highly significant differences of years and location.

DeSoto and LaSalle have the highest average dry weight content, with LaSoda having the lowest. The tubers grown at Plaquemines and at Thibodaux in 1950 have the highest contents, whereas in 1949 they had the lowest contents.

Discussion

In view of the extensive use of the potato, it is highly important that investigation be made of conditions affecting the food value. The environment seems to play an important part in the production of ascorbic acid. The part that it actually does play is as yet not fully known or understood. Many factors, such as light intensity, available water, soil type, and temperature play a vital role.

It was thought that there might be a correlation of the ascorbic acid content with the dry weights of the varieties to locations. Partial correlation, however, for several locations was determined but it was found impossible to correlate the ascorbic acid and dry weight for all locations for both years.

DeSoto and LaSalle have the highest average dry weight contents with LaSoda having the lowest content. The tubers from Plaquemines and Thibodaux varied greatly from year to year. In 1950 they had the highest dry weight, whereas in 1949 they had the lowest content.

Summary

Five varieties of recently harvested potatoes, LaSoda, DeSoto, Katahdin, LaSalle and Triumph from five locations in Louisiana were analyzed for their ascorbic acid and dry weight contents.

The data obtained from the two years at five locations were combined and the results analyzed. Using the analysis of variance it was learned

that there were significant differences among locations in the amount of ascorbic acid manufactured by the potato plant. The differences among the varieties themselves were not significant.

The data for dry weights indicated that there are highly significant differences in the varieties, but of still greater importance are the highly significant differences of years and locations. It was found that no correlation existed between ascorbic acid and dry weight.

If these data are verified it will give one locality a selling point over another locality. Of course, in certain localities there may be other factors, such as yield, disease, *etc.*, which may hinder the raising of potatoes just for higher ascorbic acid content.

In view of the growing industry of canning potatoes, it is thought that consideration should be given to the vitamin C content. Improved techniques of canning allow for the retention of a greater amount of vitamin C in some other foods than was previously possible. For this reason the content of the tuber is of great importance and investigations are being continued with this objective in mind.

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EFFECT OF VARIOUS METHODS OF HANDLING SEED POTATOES IN PREPARATION FOR PLANTING[1]

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(Accepted for publication December 29, 1950)

The majority of potato growers in the United States cut seed not more than a day or two prior to planting. Some of the more extensive operators find it desirable to cut several days ahead to ensure no delay after the planting operation has started. In the British Isles and on a part of continental Europe, it is common practice to greensprout the seed tubers in specially constructed trays or racks. This operation requires a treatment period of four to eight weeks and is said to hasten the development of an early crop and to increase yield. Fifty years ago, many growers dusted the fresh-cut seed with land plaster or other drying material to prevent "Bleeding" regardless of whether the seed was to be planted at once or held several days.. A few investigators have shown how cut seed can be "cured" by storing it under conditions favorable for the formation of a wound periderm or callus over the cut surface to protect it subsequent to planting from unfavorable soil conditions which might cause rot. Curing of cut seed is often recommended for occasions when it is necessary to store cut seed several days or weeks before planting. More recently, the dusting of seed, either cut or uncut, with certain hormones or growth-promoting substances has enlisted the interest of a few investigators, but the practice is still in the experimental stage. Rootone, Transplantone, and Tubertone all carry the hormone in the form of naphthaleneacetamide are now available and there have been favorable reports for each in some instances.

The writer reported results of trials with Rootone and Transplantone applied as a dust to fresh-cut seed potatoes in 1943 (1). Rootone reduced the yield and showed evidence of toxicity. Transplantone applied at 2 ounces to the bushel of cut seed gave some yield increase but not significantly above that of the untreated seed. In the same report (1), results for 1944 comparing dusted, cured, greened, and hormone-treated cut seed with untreated seed were given. The greensprouted seed emerged earlier and gave an increased yield over the check plants but the yield difference was not statistically significant. Although Tubertone gave results superior to Rootone, both of these hormones resulted in a delayed emergence and a reduced yield.

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[1] Published as paper No. 338, Department of Vegetable Crops, Cornell University, Ithaca, N. Y.

Experimental Procedure

Tests of the effects of various methods of handling seed potatoes prior to planting were continued during the years 1945, 1947, 1948, 1949 and 1950. Dusting of fresh-cut seed with ground limestone, curing, greensprouting, and treatment of fresh-cut seed with the hormone Tubertone were compared with fresh-cut, untreated seed. The Green Mountain variety was used in 1945, Sebago in 1947, and Katahdin in the remaining three years. The period of treatment prior to planting each year ranged from 28 days in 1945 to the shortest period, 22 days in 1947, roughly speaking, from three to four weeks. Equal weights of seed for each treatment including the check were weighed out on the date the experiment was set up. The seed for the check and the Tubertone treatment was replaced in cellar storage. One lot was cut and thoroughly dusted with ground limestone, set in a workroom and covered to prevent greening. Another lot was cut and stored similarly but left otherwise untreated. Another lot was cut and placed in a curing room where the humidity was kept high for a few days by placing wet burlap sacks over the crate of stored seed and maintaining the temperature at approximately 60° to 65°F . Still another lot was placed uncut in a single tuber layer on a shelf near a window for greensprouting. Through an oversight, no Tubertone was applied in 1950. This material was used, however, in field tests on nearby farms. In all cases, the treated lots were planted in single row plots of 25 plants spaced 12 inches apart and in randomized blocks. During the years 1945, 1947 and 1948, there were eight replications whereas in 1949 and 1950 there were six replications of each treatment.

Experimental Results

On the date of planting, when the final treatments were applied, each lot was weighed to determine the effect of the treatment on weight loss. The respective weight losses are given below in table 1.

Table 1.—*Effect of treatment on weight loss of seed 1945-1950*

Treatment	Per cent Weight Loss of Seed During Treatment					
	1945	1947	1948	1949	1950	Average
Fresh-cut	3.0	1.8	1.8	1.8	0.7	1.8
Dusted and stored	9.0	23.8	5.5	16.5	18.8	14.7
Cut and cured	15.0	6.9	6.5	14.3	27.5	14.0
Cut and uncured	—	25.8	5.5	15.0	18.8	16.3
Greensprouted	5.0	8.0	4.5	10.0	5.0	6.5
Tubertone	3.0	3.0	2.5	0.3		2.2

Shrinkage in weight averaged 14 to 16 per cent during the treatment period for those lots which were stored after cutting. There is no evidence here that dusting cut seed to be stored for a period before planting in any way prevents drying. It is equally evident that curing or callusing did not prevent shrinkage even though the seed was held under relatively high humidity. Usually the cured seed developed a good callus, however, a surface mold and slimy rot developed in one instance when the wet burlap cover was left over the container too long and too little aeration was provided.

Speed of emergence of plants is a useful measure of the influence of potato seed preparation. A quick come-up gives the plant a longer functional growth period and increased resistance to injury by the rhizoctonia fungus. Earlier emergence is one of the advantages claimed for the greensprouting treatment. To measure the influence of the different seed preparation treatments, stand counts were made when about one-half of the plants had emerged. In 1949, a count of the number of plants exceeding 4 inches in height was taken 18 days after planting instead of the usual stand count. The influence of treatment on the rate of emergence is summarized for the 5-year period in table 2.

TABLE 2.—*Relation of treatment to speed of emergence 1945-1950.*

Treatment	Per cent of Plants				
	Emerged 26 Days after Planting 1945	Emerged 21 Days after Planting 1947	Emerged 17 Days after Planting 1948	Over 4" tall 18 Days after Planting 1949	Emerged 17 Days after Planting 1950
Fresh-cut	100	92	54	12	35
Dusted and stored	68	77	53	21	40
Cut and cured	44	77	48	15	39
Cut and uncured	—	84	43	12	36
Greensprouted	94	95	71	36	52
Tubertone	99	86	53	3	—

Of the six treatments, greensprouting is the only one which showed a consistently increased rate of emergence from counts made within three weeks from planting date. The hormone Tubertone applied at the rate of two ounces to the bushel of cut seed, did not show any stimulation of early sprout growth. In fact, in 1949 the small percentage of plants (3 per cent) over 4 inches tall 18 days after planting, indicates some toxicitity that oc-

curred early in the growth period. In these trials and from the experience reported by others, this early retardation of growth is later followed by growth stimulation.

Just before planting, sprout condition of each of the treatments was noted, because this factor is known to influence rate of emergence. During the five years, the sprouts on the fresh-cut seed and on seed stored similarly for the hormone treatment were longest, whitest, and most brittle. It is estimated that about one-half of these sprouts broke off in the handling incident to the cutting and planting of these two lots of seed. On the contrary almost none of the sprouts developed on the greensprouted tubers was broken off before planting.

The ultimate proof of the value of any method of handling or treatment of seed potatoes prior to planting is in its significant increase in yield over untreated seed. Total yields in bushels to the acre are recorded for each treatment for the 5-year period in table 3.

TABLE 3.—*Effect of seed preparation on total yield 1945-1950*

Treatment	Total Yields in Bushels per Acre				
	1945	1947	1948	1949	1950
Fresh-cut	177	378	406	241	341
Dusted and stored	121	359	469	262	324
Cut and cured	91	388	453	276	283
Cut and uncured	—	373	467	254	332
Greensprouted	181	415[1]	470	231	270
Tubertone	182	412[1]	467	249	—
L. D. @ 19:1	16	—	52	N.S.[2]	N.S.[2]

1 Significantly higher than dusted seed.
2 N.S. differences not significant.

Only in 1948, did any of the treatments give total yield increases significantly higher than the untreated seed. In that year, all treatments gave increases and all increases except for the curing treatment were statistically significant. In 1945, dusting gave yields significantly higher than curing but the yields from both dusting and curing were significantly lower than those from the fresh-cut seed, or from the greensprouted or hormone-treated seed. In 1947, the greened and the Tubertone-treated seed gave yields significantly higher than did those from the dusted cut seed, but not statistically greater than the other treatments. Despite an earlier emergence of plants from the greensprouted seed in 1949 and 1950, the lowest

average total yields were harvested from this treatment in both years. The differences, however, were not significant.

Conclusions

In a series of replicated trials during the period 1945-1950, various methods of storing and preparing seed potatoes during the three to four weeks prior to planting were compared as to their effects on weight loss of seed, speed of emergence, and total yield. These treatments included dusting of cut seed prior to dry storage, dry storage of cut seed uncured and undusted, cured cut seed, greensprouted seed stored uncut, fresh-cut seed treated with the hormone Tubertone, and fresh-cut untreated seed using the varieties Green Mountain, Sebago, and Katahdin. The three treatments which required storage of cut seed for a period of 3 to 4 weeks resulted in an average loss of 14 to 16 per cent in weight but this loss was not reflected in the ultimate yields. The greensprouted seed lost an average of only 6.5 per cent in weight during the period of treatment.

Stand counts taken within three weeks after planting as a measure of treatment effect on rate of come-up, showed that greensprouting was the only method of preparation which consistently increased the speed of emergence. In only one of the five years, however, was this difference reflected in a significantly higher yield.

On the basis of yield increase compared with that from the fresh-cut seed, none of these methods of handling or treating seed prior to planting seems to be justified. Curing of cut seed might be an advantage when it is necessary to store it for a long period before planting and when seed-bed conditions are unfavorable. Likewise, greensprouting might be profitable where early come-up and an early market crop are the objectives. None of the hormone dusts is yet developed to the point where it can be recommended. A large scale test of Tubertone made on a farm in Cayuga County, New York in 1950 resulted in a 14 per cent increase in yield. Through failure to take replicate samples, however, the significance of this apparent increase was not established.

Literature Cited

1. Hardenburg, E. V. 1945. Comparative studies of several potato treatments. Amer. Potato Jour. 22:1-5.

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